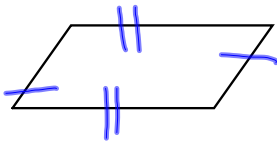
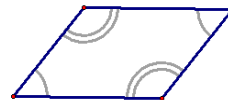


8.3 Tests for Parallelograms

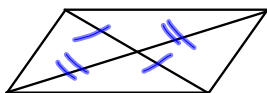
Theorem 8.9 If both pairs of opposite sides are congruent, then the quadrilateral is a parallelogram.



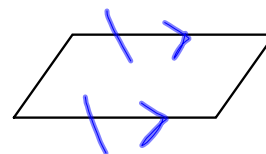
Theorem 8.10 If both pairs of opposite angles are congruent, then the quadrilateral is a parallelogram.



Theorem 8.11 If the diagonals bisect each other, then the quadrilateral is a parallelogram.

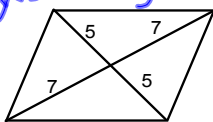


Theorem 8.12 If one pair of opposite sides is both congruent and parallel, then the quadrilateral is a parallelogram.

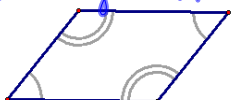


Are the following parallelograms? Why?

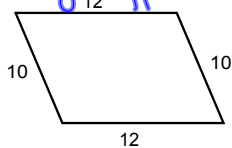
yes diag. bis. each other



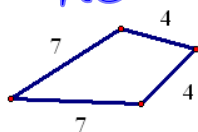
yo opp \angle s



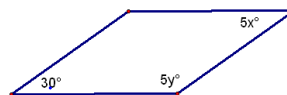
yo opp sides \cong



no



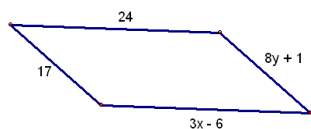
Find x and y so that the quad. is a parallelogram.



$$5x = 30 \\ x = 6$$

$$5y = 150 \\ y = 30$$

Find x and y so that the quad. is a parallelogram.



$$3x - 6 = 24 \\ 3x = 30 \\ x = 10$$

$$8y + 1 = 17 \\ 8y = 16 \\ y = 2$$

Parallelograms on the coordinate plane.

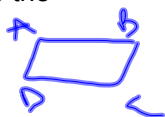
- distance, midpoint, and slope can be used to determine if a quadrilateral is a parallelogram

$$d = \sqrt{(x_2 - x_1)^2 + (y_2 - y_1)^2}$$

$$M = \left(\frac{x_1 + x_2}{2}, \frac{y_1 + y_2}{2} \right) \quad m = \frac{y_2 - y_1}{x_2 - x_1}$$

Determine whether a figure with the given vertices is a parallelogram. Use the indicated method.

A(0, 0) B(1, 3) C(5, 3) D(4, 0)



Slope formula

$$\overline{AD} \quad m = \frac{0-0}{4-0} = 0$$

$$\overline{AB} \quad m = \frac{3-0}{1-0} = 3$$

$$\overline{BC} \quad m = \frac{3-3}{5-1} = 0$$

$$\overline{DC} \quad m = \frac{3-0}{4-0} = 3$$

Yes both pairs of opp sides are \parallel .

Determine whether a figure with the given vertices is a parallelogram. Use the indicated method.

A(-1, 0) B(3, 0) C(2, -3) D(-3, -2)



Distance formula

$$AB = \sqrt{(3-(-1))^2 + (0-0)^2} = 4$$

Not

$$DC = \sqrt{(2-(-3))^2 + (-3-(-2))^2} = \sqrt{26}$$

a parallelogram

Determine whether a figure with the given vertices is a parallelogram. Use the indicated method.

A(-2, 4) B(-1, -1) C(3, -4) D(2, 1)

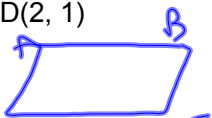
Midpoint formula

↪ diagonals

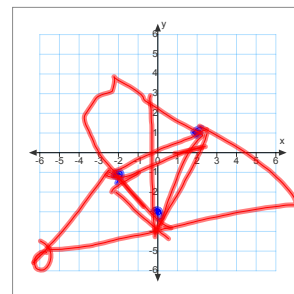
$$AC \quad m = \left(\frac{-2+3}{2}, \frac{4+(-4)}{2} \right) = \left(\frac{1}{2}, 0 \right)$$

$$BD \quad m = \left(\frac{1}{2}, 0 \right)$$

yes, diagonals bisect each other



A parallelogram has the vertices (-2, -1) (2, 1) and (0, -3). Find all possible coordinates of the 4th vertex.



HW

p421-422

~~13-20, 22, 25, 28, 29~~

13-18, 25, 28, 29